

Interactive comment on “Flood-initiating catchment conditions: a spatio-temporal analysis of large-scale soil moisture patterns in the Elbe river basin” by M. Nied et al.

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The present paper describes comparative study on simulated soil moisture pattern and flood triggering. The topic is of great interest and the paper provides an interesting approach for the identification of soil moisture patterns that can be observed at the beginning of a given flood event. I think that the paper deserves to be published but I have a general comment on the structure of the paper that needs to be addressed. It is my feeling that the two procedures used in this paper (the principal components (PC) and the cluster analysis) do not have a clear connection. In particular, the first

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is used just to describe the main characteristics of soil moisture pattern demonstrating that most of its dynamics is dictated by seasonal fluctuations. I'm probably driving this to the extreme synthesis, but I do feel that this part of the paper (the PC analysis) can be removed without losing the main outcomes of the paper. Moreover, I believe that this will extremely improve the readability of the paper, where the two analysis seem to be two independent part. I suggest to focus much more on the cluster analysis that as matter of fact represent the main objective of this paper.

In the following, I have reported a number of point that deserve some attention:

1. The paper is too long and needs to be shortened. There are several repetitions that must be removed. I suggest to remove the PC analysis and to condensate the results and the discussion sections in only one section.
2. Analyses presented here are based on modelled data and it is absolutely necessary to verify the reliability of the results. In particular, the hydrological model adopted has a significant number of parameters that may be easily tuned in order to obtained an acceptable response. Now, the problem in these cases is very well addressed in the paper of Kirchner (2006) that says “advancing the science of hydrology will require not only developing theories that get the right answers but also testing whether they get the right answers for the right reasons”. So my question is the following: Are you sure that the model perform well for the right reason? A correct interpretation of the stream flow does not necessarily implies a good interpretation of the soil moisture patterns.
3. One problem that I think may affect soil moisture description at the local scale is the use of the CN method that is a method developed at the basin scale but not reliable at the local scale.
4. Page 10058: Modelling assumptions may impact significantly on the obtained simulated patterns. The use of two markedly differ soil maps have an impact that

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one may recognize in the observed patterns of the principal components (see PC2). This is one question that should be addressed in the paper and that may produce misleading results.

5. The authors states that the model provides a significant overestimation of the runoff (28%-40%) (see page 10068 lines 7-9). This result is due to the fact that the model was optimized in order to provide a correct description of flood events obtaining as a consequence significant errors in the water balance. This may affect the estimation of evapotranspiration and also the resulting soil moisture.
6. page 10060 line 22-24: The term soil transpiration is inappropriate. Use the term soil evaporation.
7. page 10067 line 1-3: Please provide a description of how the start dates of flood event were identified.
8. page 10068: It would be extremely useful to provide a list of the calibrated parameters.
9. Page 10068 The authors use the term soil moisture profile, but you probably they refer to soil moisture map.
10. page 10068 line 23-26: The authors highlighted the differences observed in the PC2 with respect to the German and Czech part of the basin, but neglect to say that this may be due to the parameters set used for the soil map (see my previous comment).
11. Figure caption are not self containing. It is very hard to understand the contents of the graphs from captions. Please try to provide more detailed descriptions.

Reference Kirchner, J. W.: Getting the right answers for the right reasons: Linking measurements, analyses, and models to advance the science of hydrology, *Water Resour. Res.*, 42, W03S04, doi:10.1029/2005WR004362, 2006.

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